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PROBLEM STATEMENT NO:
DATE OF RECEIPT:

Montana Department of Transportation

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STAGE I RESEARCH PROBLEM STATEMENT

I. PROBLEM TITLE (required): Assessment of sediment disturbance in streams during bridge construction

II. PROBLEM STATEMENT (required): Montana water-quality standards for sediment disturbance in streams at construction sites are based on standards that describe a qualitative visual assessment of turbidity increases. As a result, the allowable degree of disturbance is ambiguous, which makes it difficult to know with certainty whether or not a job site is within compliance. A quantitative assessment of suspended-sediment concentrations and loads at selected locations upstream and downstream from bridges before, during and shortly after construction activities would provide a more reliable means to evaluate the magnitude and duration of disturbance.

III. RESEARCH PROPOSED (required): It is proposed that the U.S. Geological Survey (USGS) obtain concurrent suspended-sediment samples and turbidity measurements, bed-material size data, and flow measurements at multiple bridge locations across Montana scheduled for repair or construction activities. The bridges would be located on various stream types representing a range of geomorphic settings and channel characteristics in order to develop a database describing the degree of construction-related sediment disturbance in channels of varying size, substrate, and hydrologic characteristics. Suspended-sediment concentrations would be documented quantitatively at one transect upstream and multiple transects downstream from the bridge to comparatively assess the progression from natural background condition to incremental spatial variations in sediment disturbance. Sampling would be conducted twice during the day: 1) during a period of active construction and 2) shortly after (within 1-3 hours) construction activities have ceased for the day. The differences in suspended-sediment concentrations during and shortly following construction activities would provide a measure of the duration of construction-related effects on suspended-sediment concentrations.

The USGS and others have demonstrated a correlation often exists between suspended sediment concentration and turbidity. An additional component of this study would include measurements of turbidity at the construction sites to further develop this correlation and create a surrogate for suspended sediment. Work done by Newcombe and others with the Ministry of Environment, British Columbia, has developed standards for severity of ill on effects on fisheries related to suspended sediment concentration, duration of exposure, turbity, and duration of exposure. The data collected as part of this effort could be compared to the standards developed by Newcombe.

After compilation of data from a wide range of stream types over 2-3 years, correlations between flow, suspended-sediment concentrations and loads, turbidity, and channel substrate can be examined. These data can be used to evaluate the relative vulnerability of different stream types to construction-related sediment increases above background conditions and the potential for adverse impacts on aquatic life, recreation, or other beneficial water uses. After enough stream types are sampled, the information could be presented to the Montana Department of Environmental Quality to aid in developing numeric standards that would represent realistic compliance goals that could be easily verified by onsite measurements of turbidity or analysis of water samples for suspended-sediment concentration.

IV. IT COMPONENT (required): Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc) or not. If so, describe IT component in as much detail as possible.

IT hardware would not need to be purchased for this project. The data obtained for the project would be stored in the USGS National Water Information System (NWIS) database, which is publicly accessible on the

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internet at http://waterdata.usgs.gov/mt/nwis . In addition, the data would be retrieved in an ms Excel spreadsheet for electronic delivery to the Montana Department of Transportation.

V. URGENCY AND EXPECTED BENEFITS (required): The urgency aspect is moderate. The immediate benefit would be the development of a database to quantitatively document the extent of sediment disturbance at bridge construction sites. Ultimately, such data could be used to aid the State in developing realistic numeric standards that could either be verifiable in the field (turbidity measurements) or by laboratory analyses of suspended-sediment concentration measured in samples collected onsite. With sufficient data to characterize sediment disturbance in various stream types, it might be possible for the State to develop multiple standards for a range of stream types to account for differences in natural levels of background suspended-sediment concentration (for example, different standards for a sand/silt bedded stream compared to a gravel/cobble bedded stream).

VI. IMPLEMENTATION PLAN (required): If the project proposal is accepted, the USGS would work with the Montana Department of Transportation to identify bridges across the State that are scheduled for construction and which represent a wide range of stream types and channel materials. Upon identifying 10-20 bridges scheduled for construction over several years, a detailed work plan and budget would be developed to conduct sampling and flow measurements at about 5-8 sites per year. It is expected that as many as 20 bridge sites could be sampled over a 3-year period. A progress report would be prepared at the end of each year to summarize the data obtained during the year.

After all sites have been sampled, a data-analysis phase would be initiated to examine the sediment response of different stream types to construction activities. The results of this assessment would be published in a formal peer-reviewed USGS report that would present the data, methods of data analysis, discussion of results, and conclusions. An estimate of cost for the data analysis and report-preparation phase would be provided separately from the budget for the data-collection phase.

VII. SUBMITTED BY: (required)

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IX. SPONSOR(S): (Internal to MDT, Division Administrator or higher)

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Note: Submitter may attach continuation sheets if necessary.